Executive Summary

A Program for Building
The Maine Public Library of Geographic Information

Background & Overview:

Maine is facing increasingly complex challenges in statewide, regional and municipal governments. Providing *homeland security*. Encouraging *economic development.* Guiding *sensible growth* while *protecting the environment*. All of these fronts require immediate and urgent attention. Addressing these issues involves activities such as the analysis of land use patterns and demographics, the monitoring of water supplies and distribution systems, and identifying critical wildlife habitats and guiding development away from them. Pursuing these activities requires adequate tools and strong technical investments. Geographic information systems (GIS) technology has proven itself an essential instrument enabling Maine to confront these issues from both policy development and implementation perspectives.

GIS has a long history, both in Maine and throughout the nation, of addressing these exact types of issues, and Maine has made an excellent start in building a strong GIS capacity. But the next steps are critical. Essential geographic data to support detailed analysis in these policy arenas are unavailable and must be assembled. Technical exchange and training are inadequate to meet demand and must be provided. Further, there are several unrealized opportunities for greater cooperation and collaboration - both between state agencies and between the state and local government - that when seized will result in important GIS synergies and efficiencies.

In recognition of these immediate challenges and opportunities the Legislature mandated a strategic GIS planning study aimed at providing a blueprint for further, coordinated development of a strong statewide GIS. This study has confirmed that further actions are required to help Maine realize a maximum return on its existing GIS investments and to position the State to better address issues of **sensible growth, environmental protection, homeland security** and **economic development**. Importantly, the plan is designed so that these actions will help the state obtain required data sets while at the same time providing significant support to the *local* GIS efforts of the cities and towns of Maine. The Legislature has already recognized the importance of moving Maine's GIS forward and developing a plan. A plan has been developed that remedies weaknesses, augments identified strengths, and leverages potentially available federal funds to the maximum extent possible. It is now time to act.

Introduction & Definition of Geographic Information Systems (GIS)

Historically, maps have been a vital tool for effectively depicting complex information. The human brain has a powerful ability to see patterns and understand relationships when large quantities of data are depicted cartographically. Maps help people to better understand their immediate environments and the world. Geographic Information Systems, known as GIS, are computer databases and software that store cartographic information and provide powerful map display and analysis capabilities.

Unlike traditional maps, users of GIS can *interact* with the map via the computer. For example, a user can "click" on a map element and ask "what is this?" The GIS can then query the database, find the element and report the characteristics, or attributes of the element. If one had clicked on a road, the GIS might return the road name, the speed limit and the date the road was last paved. Similarly, a GIS user can query the database of map attributes to search for patterns or look for trends. One might go to the GIS database and query road attributes to find "all roads that had not been paved within the last 10 years". The GIS would then return a *map* that would show the location and distribution of all those roads. Such a map would be very important for planning capital improvements to a road network and it would be extremely difficult and time consuming to produce without GIS technology. Further, the same roads data set could be used for a diversity of additional purposes such as routing emergency vehicles in response to an accident, modeling traffic flows, or storing accurate address information.

Due to the power of this type of query capability, as well as robust map editing functionality, during the 1990's GIS became ***the primary tool*** large organizations, and increasingly small organizations, use to create, manage, and use maps. Whether in private firms such as DeLorme or Rand McNally, federal agencies like the USGS or US Forest Service, state agencies, regional councils or municipal governments, GIS is now employed as a common and indispensable productivity tool.

Recently, GIS capabilities have been brought to the World Wide Web. GIS is no longer a technology limited to technical specialists. GIS data and GIS capabilities are readily accessible by web browsers through high volume Internet sites such as MapQuest.com or the National Geographic Map Machine. Further detailed application capabilities are offered by a rich array of Maine-based GIS and mapping firms. This type of wide data availability has helped create an increased awareness of the importance of GIS. In addition, more universal geographic data access has helped increase the returns on data investment by enlarging the number of users, and broadening the range of uses of a single GIS database.

History of GIS Use in Maine and an Overview of the Proposed Program

The State of Maine has been an active user of GIS technology since the 1980's. Maine has made solid GIS investments within many departments and state agencies. In addition, the Maine Bureau of Information Systems houses the Maine Office of GIS (MeGIS) which acts as a state level service bureau and provides centralized access to GIS data for the general public and private sectors. MeGIS estimates that Maine has invested approximately $20 million dollars in GIS data and applications to date, with a current annual outlay of approximately $2 million per year in agency operating expenses tied directly to GIS.

Maine's GIS programs have evolved with the technology over time. Initially and by technical necessity, these were isolated and independent systems, serving ***individual*** application needs. Later these independent systems were loosely coupled and confederated, and GIS grew to serve and satisfy ***departmental*** requirements. As explicit coordination between agencies and departments has emerged and become established, and as hardware, software and network capabilities have reached a sufficient user base, ***multi-departmental*** GIS have begun to appear.

At present, there is increasing GIS activity both within state agencies and within municipal and regional governments. This increase in participants has enlarged the need for, and value of coordination and it has also highlighted a few important data and technology gaps in Maine. Based on the research conducted through this study, it is time for a further, natural evolution of GIS throughout the state. It is time for Maine to take the technology to the next level, and move toward a true ***enterprise*** GIS for state government and a strong ***statewide*** GIS for the entire population of users.

> ***The question is whether this evolution proceeds disconnectedly from independent sites with the inherent risk of duplication of effort and crippling inefficiencies, or whether it is executed according to a well-coordinated plan involving Maine's many GIS stakeholders.***

This study documents how several targeted GIS investments will help Maine realize a greater return on a decade's worth GIS investments while solving several operational problems that GIS users in Maine currently face. In addition, as Maine grapples with important regional issues such as sensible growth and economic development, GIS offers rich possibilities for supporting policy development and implementation, *provided that* the appropriate data sets are available. At present, there are key gaps in several of these data sets and there is an overall lack of standards that hinders collaborative data development.

Perhaps most importantly this proposed program intends to create an explicit coordination mechanism between the state and numerous regional and local GIS efforts. While there are good examples of coordination between state agencies, there is room for significant improvement; furthermore, intra-governmental GIS coordination between the state and regional/local efforts is lacking. Filling this void is increasingly important as local efforts continue to accelerate.

Achieving this level of coordination will create an important "win-win" for Mainers. First, local governments will greatly benefit from state support during the critical startup phases of GIS development. Seed money for data development as well as technical support will go far in helping new communities become involved with GIS. Second, the state and federal governments will greatly benefit by having increased electronic access to important locally controlled GIS data sets such as parcels and zoning. Activities such as sensible growth and economic development ***require*** access to these types of local data.

History of the Resolve 23 Process and Genesis of this Study

Recognizing opportunities to capitalize on new technology and to advance Maine's statewide GIS program to include new data sets and further coordination, both MeGIS and the interdepartmental GIS Executive Council began planning for a more robust statewide GIS initiative in 1999-2000. Based on this planning, during 2001 a proposal emerged to fund statewide parcel automation partially as a means of expanding the statewide GIS to better handle ongoing sensible growth and development tracking efforts.

During consideration of this proposal there was agreement that given the magnitude of the initiative there was a need to better understand statewide GIS capabilities and to craft a more detailed and specific implementation strategy. Rather than passing the initial proposal, the Legislature authored Resolve 23 and initiated a specific planning process aimed at determining the best course of action for further developing Maine's statewide

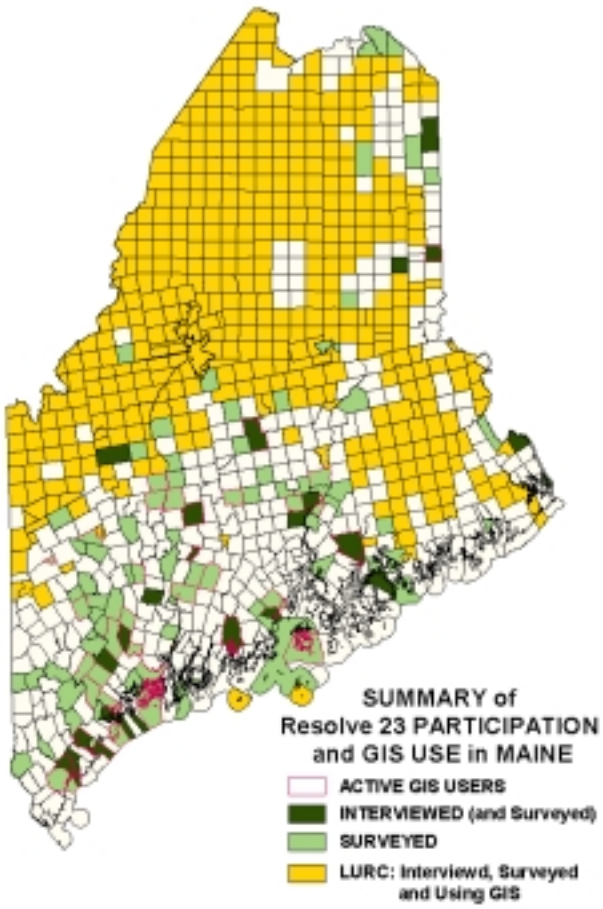
GIS. The Legislature created a Steering Committee composed of representatives of state, regional and local governments as well as members of the private sector and academic communities to oversee this planning process. The Legislature charged the Steering Committee with reporting their findings and recommendations during January, 2002.

During the Summer of 2001, the Steering Committee issued a request for proposal to obtain professional consulting assistance in developing this plan. Applied Geographics, Inc, teamed with CDM and GIS Mapping & Analysis, Inc., won the contract to perform the planning by working in close association with both the Steering Committee and the MeGIS staff. This study is the result of that planning effort.

Major Findings from the Needs Assessment

During the Needs Assessment, exhaustive and concerted effort was directed at contacting and querying as many GIS stakeholders in Maine as possible. Over 65 individual parties were directly contacted and interviewed in an attempt to fully understand the needs for an expanded statewide GIS program in Maine. Interviewees included 22 individual municipalities, 14 regional governmental entities, 18 state agencies, 5 utilities, 9 federal agencies as well as members of the academic and private sector communities. Within municipalities, the team spoke with various Assessors, Planners, Town Managers/Executives and staff from Public Works and Engineering Departments.

In addition, the Needs Assessment phase of this project created and disseminated a "GIS status" survey. This survey was actively distributed at the Maine Municipal Association (MMA) annual conference and an "on-line" version was placed on the web. Over 225 survey responses have been tabulated into a database and these responses were evaluated in determining the overall needs. The figure to the right indicates the broad participation in the Needs Assessment process.



From the interviews and surveys, several major findings of need emerged. These included:

- ***Wide Interest in GIS:*** There was an incredibly high degree of interest in GIS and in an expanded statewide GIS program from almost all entities interviewed. The figure to the right identifies communities that were contacted through this study as well as many of the municipalities in

Maine that are currently pursuing GIS. People were aware of what the technology offered and were eager to become more involved. Most parties strongly believed that statewide efforts would greatly assist local and regional entities in becoming more involved with GIS.

- ***Multiple Statewide Initiatives:*** There are several state government agencies aggressively pursuing GIS on a statewide basis. While there are explicit efforts at coordination, there remains some duplication of effort and room for further, better coordination among these programs. For instance, there is no single location where all of the best state-produced GIS data for Maine currently exists. If an entity needed to collect all of the data for Maine, they would need to visit multiple state agencies.

- ***Large Need for Education & Technical Assistance:*** Although there is a high degree of GIS activity within local and regional governments, many of these efforts are hindered by a lack of technical assistance, and basic problems can prove difficult to overcome. Similarly, there are many nascent GIS efforts at the local level that could be greatly aided by outreach and education from the State. Disseminating information on topics such as costs/benefits of GIS, application examples for municipal government and the development process for constructing a GIS would be extremely valuable.

- ***Requirements for New Data:*** While Maine has made an excellent start at developing statewide data sets, there remain several important gaps that hinder the ability of the state and other entities to tackle problems such as sensible growth, economic development and environmental protection. Notable gaps include: **parcels, zoning, protected open space** and **land cover**. In addition, the availability of a high-quality, statewide aerial-photo base map would be very helpful for catalyzing and improving the quality of local data development efforts (e.g. parcels and zoning).

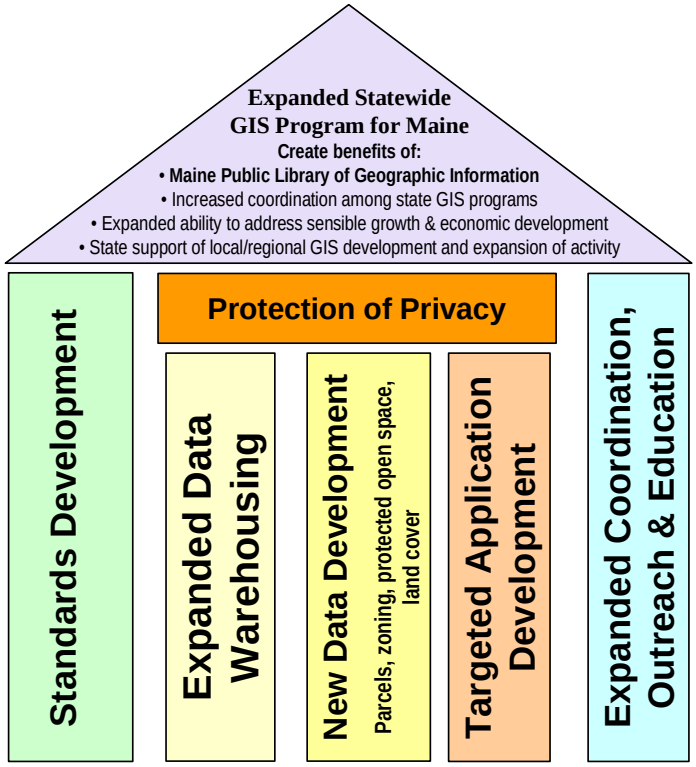
- ***Incremental Improvements in Operational Efficiency of MeGIS:*** There was a high degree of praise for MeGIS and the data sets it distributes, but several suggestions were made for operational improvements. These centered on desired enhancements to the current data distribution system, issues with existing data formats, and difficulties with metadata and technical support. These types of efficiencies could be added relatively easily with some targeted investments in newer technology and associated applications.

- ***Requirement for Statewide Standards:*** There were numerous state agencies that described difficulties in collecting useful map information from municipal governments, even when state funding was supporting local mapping (e.g. through SPO's Comprehensive Planning studies). These difficulties implied a need for an overall statewide framework for housing important data sets created with state funds. Further, data standards are required to ensure that all local participants are aware of the state's expectations for map data delivery. It is critical that the state develop an ethic of "no wasted data development with state dollars". This ethic would extend to local municipalities receiving state funding as well as to the state's own contractors. Such a framework, and a good set of

standards are necessary for the creation of useful regional and statewide data sets (e.g. parcel and zoning) based on the combined efforts of multiple parties.

Major Recommendations and a Proposed Plan of Action

In light of the major findings described above, the Steering Committee has prepared a series of recommendations aimed at addressing these needs. The figure below shows that these recommendations can be viewed as five pillars upon which an expanded GIS program for Maine will be built. Further detail on each pillar is provided below.



- ***Standards:*** Maine should develop a comprehensive set of standards describing the format and content of all data sets to be developed with state dollars. Such standards are necessary to guarantee good data content in an environment where there will be data contributions from multiple levels of government. In some cases, this will be codifying existing standards and in other cases it will mean developing new standards (e.g. for parcels). Importantly, Maine must also consider a program for standards *enforcement.* Absent enforcement, standards have much less value.
- ***Expanded Data Warehousing:*** A key goal of the overall expansion of Maine's statewide GIS is to create a **Maine Public Library of Geographic Information** (also referred to as the GeoLibrary). All of the state's geographic data will be collected and made available through this library. Creation and management of individual data components will remain decentralized at individual state, regional and local governmental entities, but the GeoLibrary will be the clearinghouse for standardized data. Creating the library will provide efficient one-stop shopping

for gaining access to Maine's *spatial data infrastructure*. Making access easier and more efficient will lead to increased use of data for multiple purposes, and produce a greater return on investment. A series of targeted technology investments can expand the existing data warehousing capacity to act as a robust public library.

- ***New Data Development:*** As described above, there is wide need for several important data sets that are currently unavailable, including: parcels, zoning, protected open space and land cover. Many of these data are created and managed at the local level, but they can be very important for understanding statewide and regional issues such as economic development, sensible growth and protection of the environment. Effectively building these data sets will require significant time as well as the cooperation of local governments. As such, this plan proposes a series of voluntary grants that would be provided to cities and towns to support their development of these data in conformance to the statewide standards. In addition, if a community chose to participate in the grant program, the terms of the grant would include a commitment to provide these data for use within the public library and to update the data over time.

  Also, recognizing that developing high-quality local data sets requires access to consistent, high-quality base mapping, this plan proposes that the state actively work with the USGS by providing matching funds for the National Aerial Photo Program and National Digital Orthophoto Program (NAPP/NDOP). Providing these funds would allow Maine to access up to $1.6M of potentially available USGS funding for creating an improved, statewide base map that would underpin much of the new parcel and zoning data development that will take place in the coming years.

- ***Targeted Application Development:*** Investment in a finite set of applications is a necessary complement to the aforementioned investments in standards, technology infrastructure and data. Just as a library needs a card catalog and indexing system, the geographic information library needs a set of tools that will help people find what they are looking for and begin putting the information to basic use. Application development areas are proposed to include: standards validation routines, basic cartographic browsing capabilities, and robust on-demand data extraction (i.e. check-out) routines. In addition, the library should be constructed so that there is an open *application development platform* whereby third-party developers can use data housed within the library for their own purposes. That is, third parties can use their own resources to build tools that can access information in the library. These third-parties may be state agencies that have their own mandate-specific application requirements (e.g. providing school bus routing assistance) or potentially private sector entities providing tools for a specific constituency (e.g. the real estate and appraisal community).

- ***Expanded Coordination, Outreach & Education:*** Research indicated that there are large opportunities for increased GIS coordination, both between state agencies and among different levels of government (i.e. between the state and municipalities). To address this issue, the plan proposes an explicit investment of resources aimed at fostering improvements in coordination. This plan envisions creating up to three new staff positions to provide this explicit coordination. In

addition, this plan recommends the creation of Regional Geographic Service Centers (aka Regional GeoCenters), likely via modest funding provided to Regional Councils and/or Counties, which can help provide education and outreach as well as important technical assistance to municipalities that are getting started with GIS. These activities will both help to catalyze further GIS effort at the local level and also help to support, manage and coordinate these local efforts in order to increase the likelihood of success.

Benefits of the Proposed Plan of Action

There are a wide variety of benefits that Maine can realize by investing in an enhanced statewide GIS program. Benefits types include: task efficiencies, avoided costs, improvements and additions to service, intangible benefits and leveraged investments. The aggregation of all these types of benefits across all GIS stakeholders in Maine can result in millions of dollars of value for the state.

The Maine Public Library of Geographic Information will provide a mechanism for *standardizing* and *centralizing* data sharing efforts in Maine. Not only will this result in a savings of state and local government staff time, but also it will leverage the investments made in data development across the state to a much wider group of potential end users. Thus, data will be shared more efficiently and the value of those data – for improved planning, decision-making and mapping - will be distributed across a wider base.

Examples of benefits from these types of GIS investments that have been realized elsewhere and could benefit Maine include:

- Hundreds of thousands of dollars per annum in task efficiencies for areas such as creating abutter's notification lists, conducting site assessments, providing permit review and spatial data maintenance
- Enhanced planning for homeland security, providing public safety, disaster response and recovery as well as emergency preparedness through maintenance of accurate and accessible infrastructure and demographic data
- Improvements in strategic targeting of economic development and new business attraction through private-public data integration partnerships
- Millions of dollars of avoided cost for such things as potential reductions in vehicle miles traveled after pursuing automated routing for school buses and other vehicle fleets
- Augmenting the ability to appropriately plan for environmental and natural resource protection for present and future generations
- Leveraging over one million dollars of available federal funding to the benefit of Maine's GIS program and users of all levels

Use of GIS in the public sector will grow in Maine over the coming years as individual organizations make investments in data, training and GIS infrastructure. Now is the time for the state to invest in efforts to coordinate these activities before opportunities for maximizing the collective return on investment of public funds are missed. *It is not a question of whether GIS will be used in Maine;* ***it is a question of how effectively limited resources will be applied and optimized***. The programs presented in this report will

provide the coordinating mechanisms to maximize the return on the State's expenditures for GIS.

Funding the Proposed Plan of Action

There are a handful of approaches in place across the country to fund GIS. These include mechanisms such as dedicated general funding, mission driven funding, assessments on agencies and cost recovery. States typically employ more than one of these approaches to fund a suite of statewide GIS functions and services. Observations of the current environment and components of the recommended funding scenario for Maine include the following:

- Particular challenges exist for addressing the funding of the ongoing, operational and maintenance costs associated with sustaining a system once it is in place. Maine will need to pursue a combination of funding approaches to support ongoing GIS in the state.
- Leveraging federal funds is an important element of the recommended funding approach. Maine should actively identify all appropriate opportunities and work to secure these funds. The proposed funding approach includes use of up to $1.6 million of available USGS funding.
- Initial operating funds for the first two years are proposed to come from an increase in the Enterprise Network Services Rate. Funding derived from this source could be utilized in FY03 and amount to approximately $300,000. This funding source will be re-examined after two years with an eye toward obtaining additional funding from non-state agency beneficiaries of the GIS system at that time.
- The majority of Maine funding in the recommended funding scenario relies on developing and passing a $6 million component of the Environmental Bond issue for 2002 measure to cover the capital investment costs over five years.
- The total program cost over a 5-year period is anticipated to be $14.4 million. This includes $6 million in new bond moneys with up to $4.5 million coming from external sources including Federal grants and municipal matching funds. The State is anticipated to invest $9.9 million over the entire 5-year period. Of those monies, $3.9 million is to cover ongoing and recurring operational expenditures, including the funding of Regional Geographic Service Centers.

Proposed Governance Structure for the Maine Public Library of Geographic Information

Recognizing that an ongoing governance structure is vital to the successful implementation of these recommendations, the Steering Committee collaboratively developed draft statutory language to establish the Maine Public Library of Geographic Information as well as a governing Board. The Board's 15 members represent stakeholders from State agencies, counties, regional councils, municipalities, public utilities, and private sector GIS vendors. In addition, the University of Maine, environmental, real estate and development interests, and the public are also represented on the Board. The President of the Senate, the Speaker of the House and the Governor will appoint members to three-year terms.

The Board will oversee GeoLibrary operations and procurements; establish and maintain standards, rules and policies regarding data to be placed in the GeoLibrary; foster ongoing coordination among GIS stakeholders; set priorities; approve expenditures of funds; seek partnerships; resolve disputes; conduct studies; and report annually to the Legislature. While the Board may develop some appropriate internal services to facilitate generalized access and use of Library data, it is the expressed intent of the legislation that the Board will not compete directly with services provided by private enterprise.

Addressing Privacy Concerns

With increasing adoption of the World Wide Web and in light of security concerns raised in the aftermath of September 11th there is legitimate, increased attention on preserving privacy in the digital age. More information is more readily available than ever before. Pursuing an expanded statewide GIS and the development of the Geographic Library raises important questions of whether privacy is compromised by creating and facilitating the distribution of further spatial data layers.

After careful consideration, the Resolve 23 Steering Committee concluded that the proposed plan of action doesn't raise any new or unmanageable privacy issues that cannot be appropriately addressed by the GeoLibrary Board. The following summarizes key points:

- Maine's spatial data are clearly in the "Public Record"
- Spatial data describing Maine, including aerial photographs, is already widely available at no user cost via sites such a MapQuest.Com, Microsoft TerraServer and a growing array of web-based data providers
- Technologies exist to provide potential privacy safeguards such as voluntary "opt-out" provisions or the suppression of sensitive information such as names
- The new Public Library of Geographic Information Board will work to determine a specific ***privacy protection policy*** for the GeoLibrary and a plan for implementing that policy

Conclusions

Maine has long understood the need for investments in state infrastructure such as roads and bridges. Increasingly, ***information infrastructure*** is being viewed as an important area for government investment at both the federal and state levels. The proposed plan of action laid out in this study represents a series of targeted investments in Maine's *spatial data infrastructure*. These investments are necessary to both help Maine gain the maximum return on investment from its previous GIS expenditures and also to enable fullest possible application of geographic data to critical issues of statewide importance such as ***sensible growth***, ***economic development, environmental protection*** and ***homeland security***.

Maine has recognized the importance of GIS investments for over a decade. The Steering Committee has meticulously put together a plan of action that will result in an effective, expanded statewide GIS capability and broad, tangible benefits. It is clear that Maine and the MeGIS program have the ability to manage this expanded statewide resource. It is time to begin developing this resource in earnest.